

WHAT IS CLAIMED IS:

1. An isolated and purified nucleic acid molecule encoding an $\alpha 2\delta-4$ calcium channel subunit protein, said nucleic acid molecule comprising a member selected from the group consisting of:
- (a) a nucleic acid molecule encoding a protein having at least a 95% identity to a polypeptide comprising amino acids 1 to 1090 of SEQ ID NO:10;
- (b) a nucleic acid molecule that is complementary to the polynucleotide of (a);
- (c) a nucleic acid molecule comprising at least 15 sequential bases of the polynucleotide of (a) or (b);
- (d) a nucleic acid molecule that hybridizes under stringent conditions to the polynucleotide molecule of (a) and has at least a 95% identity to the nucleic acid encoding a polypeptide comprising amino acids 1 to 1090 of SEQ ID NO:10;
- (e) a nucleic acid molecule that encodes a splice variant of a human alpha 2 calcium channel comprising exon 1B;
- (f) a nucleic acid molecule that encodes a splice variant of a human alpha 2 calcium channel comprising exon 37B; and
- (g) a nucleic acid molecule that encodes a splice variant of a human alpha 2 calcium channel comprising exon 1B and exon 37B.
2. The nucleic acid molecule of claim 1 wherein the polynucleotide is RNA.
3. The nucleic acid molecule of claim 1 wherein the polynucleotide is DNA.

4. The isolated and purified nucleic acid molecule of claim 1, having a nucleotide sequence of (SEQ.ID.NO.:9).
5. An expression vector to express an $\alpha 2\delta-4$ calcium channel subunit protein in a recombinant host, wherein said vector contains a nucleic acid sequence encoding a $\alpha 2\delta-4$ calcium channel subunit protein.
6. The expression vector of claim 5 wherein the expression vector contains a nucleic acid molecule encoding an $\alpha 2\delta-4$ calcium channel subunit protein having at least a 95% identity to a polypeptide comprising amino acids 1 to 1090 of SEQ ID NO:10.
7. A recombinant host cell containing an expression vector of claim 5.
8. The recombinant host cell of claim 7, wherein said nucleic acid molecule has a nucleotide sequence encoding an $\alpha 2\delta-4$ calcium channel subunit protein having at least a 95% identity to a polypeptide comprising amino acids 1 to 1090 of SEQ ID NO:10.
9. A protein, in substantially pure form having at least a 95% identity with a polypeptide comprising amino acids 1-1090 of SEQ ID NO.:10.
10. The protein according to claim 9, having an amino acid sequence of: SEQ.ID.NO.:10.
11. A monospecific antibody immunologically reactive with an $\alpha 2\delta-4$ calcium channel subunit protein.

12. The antibody of Claim 11, wherein the antibody blocks activity of the $\alpha 2\delta-4$ calcium channel subunit protein.
- 5 13. A method for expressing an $\alpha 2\delta-4$ calcium channel subunit protein in a recombinant host cell, comprising the steps of:
- (a) transferring an expression vector capable of encoding an $\alpha 2\delta-4$ calcium channel subunit protein into a cell; and
- (b) culturing the cells under conditions that allow expression of the $\alpha 2\delta-4$ calcium channel subunit protein from the expression vector.
- 10 14. A method for identifying compounds that alter $\alpha 2\delta-4$ calcium channel subunit protein activity in a cell, comprising the steps of:
- a) contacting a compound with a cell containing an $\alpha 2\delta-4$ calcium channel subunit, and
- b) measuring a change in the cell in response to the contacting step.
- 15 15. The method of claim 14 wherein the cell contains three additional calcium channel subunits: an alpha2 subunit, a beta subunit, and a gamma subunit; and wherein the three subunits and the $\alpha 2\delta-4$ subunit form a calcium channel complex.
- 20 16. The method of claim 15 wherein the calcium channel complex is an L-type Voltage Sensitive Calcium Channel.
- 25 17. The method of claim 15 wherein the measuring step is measuring the influx of Ca^{2+} into the cell.
18. A method comprising the steps of:

- (a) incubating a cell membrane from a cell expressing recombinant $\alpha_2\delta$ -4 with radioactive gabapentin (GBP) and a candidate compound, wherein the membrane comprises an $\alpha_2\delta$ -4 subunit of calcium channel and wherein the incubating step is for sufficient time to allow GBP binding to the $\alpha_2\delta$ -4 subunit of calcium channels in the cell membranes,
- 5 (b) separating the cell membranes from unbound radioactive GBP,
- 10 (c) measuring binding of the radioactive GBP to the cell membranes, and
- 15 (d) identifying a compound that inhibits GBP binding by a reduction of the amount of radioactive GBP in step (c) to an established control.
19. A method for identifying compounds that alters $\alpha_2\delta$ -4 calcium channel subunit protein activity, comprising the steps of:
- 15 (a) combining a compound, a measurably labeled ligand for the $\alpha_2\delta$ -4 calcium channel subunit protein, and a $\alpha_2\delta$ -4 calcium channel subunit protein, and
- 20 (b) measuring binding of the compound to the subunit protein by a reduction in the amount labeled ligand binding to the $\alpha_2\delta$ -4 calcium channel subunit protein.
20. A compound active in any one of the methods of Claim 14, Claim 25 18, or Claim 19, wherein said compound is an agonist or antagonist of an $\alpha_2\delta$ -4 calcium channel.

21. A compound active in the method of Claim 14, wherein said compound is a modulator of expression of a $\alpha 2\delta-4$ calcium channel subunit.
 22. A pharmaceutical composition comprising a compound active in the method of Claim 14, wherein said compound is a modulator of calcium channel activity.